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Case report

Status differentiation, agricultural intensification, and pottery production in precapitalist Kiyyangan, Ifugao, Philippines

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ABSTRACT

We explore the relationships among the development of status differentiation, the shift to wet-rice cultivation, and ceramic specialization in the Old Kiyyangan Village (OKV), Ifugao between 900 CE and 1800 CE. Recent archaeological investigations at the OKV have established the intensification of status differentiation associated with the introduction of wet-rice cultivation in the region. Previous models suggest that wet-rice cultivation in the region was at least 2000 years old, but current research establishes that the shift to wet-rice farming occurred soon after the arrival of the Spanish colonizers at ca. 1650 CE in the northern Philippines. For elsewhere in the Philippines, Junker (1994, 1999) argued that the emergence of social differentiation in Tanjay, Negros, in the central Philippines coincided with increases in the pottery specialization, which also signified elite control of craft production and distribution. In addition, Stark (1995) viewed agricultural intensification as one of the conditions for the emergence of craft specialization in Dalupa, Kalinga. This paper explores the models proposed by Junker and Stark to investigate ceramic standardization, agricultural intensification, and status differentiation in the OKV. Our analyses of the dimensions of utilitarian earthenware ceramics from OKV suggest low degrees of specialization in pottery production, even when there were increases in social differentiation and agricultural intensification.

1. Introduction

Craft specialization was initially thought to be related to economic changes during which specialists emerged as a group who did not need to produce their own food but could focus on their craft (Arnold and Munns, 1994: 475; Evans, 1978: 115). As such, studies on specialized production became a central theme in archaeological investigations and have been defined in a variety of ways (i.e. Clark, 1995; Costin, 1991, 2001: 275–276; Cross, 1993; Rice, 1981). Rice (1991: 263) however, argued that the concept of specialization is better understood in terms of exchange systems, rather than substituting subsistence practices for specialized craft production. Similarly, Costin (1986: 328) uses an exchange model to explain specialization, but rejects definitions that link craft production with subsistence (Costin, 2001: 334). She defines specialization as part of a production system where "producers depend on extra-household exchange relationships at least in part for their livelihood, and consumers depend on them for acquisition of goods they do not produce themselves" (Costin, 1991:4).

Under these definitions, it is apparent that there is a direct link between craft specialization with changes in economic and political systems. In many studies, ceramic production has been utilized as an indicator of the emergence of increasing cultural complexity (Brumfiel and Earle, 1987; Childe, 1936; Clark and Parry, 1990; Earle, 1981; Evans, 1978). Archaeologists have long argued that craft specialization is a feature of complex polities and craft specialization is commonly identified through statistical standardization of specific dimensions of a particular item – standardization as evidence of specialization. A regional example of the application of this concept is Junker's (1994, 1999) work in the central Philippines, where she used pottery standardization as a proxy for elite control of craft production and distribution. She argued that this control led to a hierarchical social structure in Tanjay, Negros (Junker, 1999; cf. Peterson, 2003).

Undeniably, increasing cultural complexity was one of the conditions by which craft specialization arose; however, it is not the only impetus for the emergence of specialists. Part-time specialization has been observed among nonstratified and small-scale societies in cases when economic intensification is documented (Stark, 1995). Stark's (1995:217) investigations in Dalupa, Kalinga, Philippines, illustrated a case where agricultural intensification (wet-rice) brought about ceramic specialization, since labor needs in the rice fields would have

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affected craft production.

This paper considers Stark's (1995) and Junker's (1994) propositions for the development of ceramic standardization and applies them to utilitarian earthenware ceramics from Ifugao, Philippines. The Ifugao are a highland group that is argued to have increased social differentiation as a response to Spanish colonialism (Acabado, 2017). Junker (1994, 1999) hypothesized that specialized ceramic production was a feature of hierarchical structure in the lowlands of Tanjay in the Philippines and that the increase in specialization can be identified by increases in the degree of dimensional standardization over time. Among the Ifugao, increasing social differentiation was accompanied by the shift to wet-rice cultivation at ca. 1650 CE, soon after the appearance of the Spanish in the northern Philippines.

We follow Rice's (1991) and Costin's (1991) approaches that argue for degrees of specialization based on the ratio of producers to consumers to explain the process of specialization that took place in the Old Kiyyangan Village (OKV), Ifugao, Philippines. Our analyses of dimensional standardization suggest a low degree of specialization in pottery production at OKV. Among the Ifugao, simultaneous intensification of food production systems and the unambiguous emergence of elite households appear at the same time, about 1650 CE.

Our analysis starts with the initial occupation of the Old Kiyyangan Village, which is placed at ca. 1000 CE, and ends when the village was abandoned in 1832 CE. Archaeological data recovered from the OKV include utilitarian earthenware ceramics; tradeware ceramics that are identified as Chinese (Song and Ming) and Vietnamese, which are regarded as heirloom ceramics and were used as rice wine fermentation vessels after 1650 CE; imported stone and glass beads; macro- and microbotanical remains; and human skeletal remains.

2. The Ifugao

Ifugao comprise one of the indigenous ethnolinguistic groups in the Philippine Cordilleras. It is also the name of the province that is home to different Ifugao ethno-linguistic groups spread through different political subdivisions (Fig. 1). The Ayangans, Tuwali, Yattuka, Kalanguya, and Keley-i are separated by social or political boundaries, each trying to be distinct from the other yet bound by a common identity, that of being Ifugao–people of *Pugaw* or the Earthworld. The Ifugao practice wet-rice cultivation, which by definition, is an intensified agricultural system. However, Ifugao wet-rice production is driven by cultural competition over prestige rather than subsistence needs (Acabado, 2015, 2017).

The Ifugao are known throughout the Philippines and in the anthropological world for their extensive rice terraces. At the turn of the 20th century two prominent figures in Philippine anthropology began an intensive investigation of the Ifugao (Barton, 1919, 1922, 1978, 1938, 1955; Beyer, 1955). In 1924, Francis Lambrecht focused on documenting traditional Ifugao customs (1929, 1962, and 1967). In 1967 and 1980, Conklin produced the most important works on the Ifugao agricultural system and land use. Recent ethnographies of the Ifugao concern gender studies (McCay, 2003; Kwiatkowski, 1999), oral tradition (Stanyukovich, 2003), culture change (Sajor, 1999), and general ethnography (Medina, 2003).

3. Analysis of social differentiation in Ifugao

To understand the development and subsequent intensification of social differentiation in precolonial Ifugao, we assess the suitability of a political economy model that was applied in the central Philippines. This approach provides an explanatory tool to link economic processes (i.e., production, distribution/exchange, and consumption) and political organization. This perspective has been particularly useful to archaeologists looking at interaction networks of precapitalist societies (e.g. Cobb, 1993, 1996; Frank and Gills, 1993; Peregrine and Feinman, 1996). The archaeological record of precolonial Ifugao suggests that the Ifugao were involved in an extensive interaction network, which could be one of the catalyst for the emergence of social differentiation in the region.

Examining the processes that led to OKV social ranking, we compare the political economy models proposed for the emergence of social differentiation and elite control in precapitalist lowland Philippines (i.e. Junker, 1994, 1999; Niziolek, 2011, 2013; Barretto-Tesoro, 2008b) with those observed in the northern highland Philippines (Acabado, 2017; Longacre et al., 1988; Longacre and Hermes, 2015), where heterarchic relationships (Crumley, 1995; White, 1995; Acabado, 2013, 2015) appear to have influenced agricultural intensification and craft production. Our investigation allows us to understand ceramic patterning that, in other studies, provided information regarding the relationship between elite control of production and the emergence of social differentiation. In our case, we hypothesize that intensified production of prestige goods did not result in high degrees of specialization. In addition, we argue that control of prestige resources, particularly the production and consumption of rice, was the basis for Ifugao social differentiation—not control of craft production itself.

Song Dynasty (960–1279 CE) stonewares and imported glass beads appear in OKV as early as the 12th to 13th century. The presence of these foreign goods increased after 1650 CE. Ming, Vietnamese, and Thai tradeware were also documented in the OKV in the later periods.

Imported glass beads with high lead content (a characteristic of glass beads produced in China starting in the early 6th Century CE [Fuxi, 2009: 8] until the Ming Dynasty [1368–1644 CE] [Brill et al., 1991]) appeared in the archaeological record of OKV as early as ca. 1400 CE. Carter et al. (2015) also documented similar glass beads in the Cardamom Mountains of Cambodia in the 15th century CE. In addition, the appearance of the Chinese glass beads was accompanied by stoneware ceramics (Acabado, 2017), suggesting an increase in the demand for imported goods.

The appearance of wet-rice soon after 1650 CE and an increase in imported items were accompanied by intensification of rituals and feasts, as supported by a surge in prestige and ritual fauna in the archaeological record (Lapeña and Acabado, 2017). Thus, status among the Ifugao during this period was tied to access to foreign goods and capability to control the production and distribution of wet-rice.

3.1. The indigenous concept of elite status

The concept of elite status in precapitalist lowland Philippines was based on potency or charisma (Bentley, 1986; Blanc-Szanton, 1990), which is archaeologically visible in high-status goods or prestige goods (Bacus, 1999; Barretto-Tesoro, 2008b; Junker, 1999). Prestige goods include foreign ceramics (Bacus, 1996, 1999, 2002; Junker, 1999), gold items (Barretto-Tesoro, 2013; Plasencia, 1589), and talismans. High status was also manifested in heavily tattooed male bodies related to headhunting and raiding activities (Scott, 1994). Tattooing among females was for beauty or to signify their high status. Junker (1999) identified Chinese ceramics to be commonly associated with elite zones in Tanjay. Barretto-Tesoro (2008b, 2009) and others (Reyes, 2010; Salazar, 2004; Scott, 1994) noted that symbols such as solar motifs, reptiles, and birds related to cosmology found on ceramics, textiles, coffins, ornaments, and body art also indicate high status. Junker's concept of elite status was tied to controlling the political economy while Barretto-Tesoro's elite category was connected to the socio-religious life of the community. Despite different approaches, both Junker and Barretto-Tesoro see evidence that elites restricted the circulation and possession of objects linked to a socio-political-economic ideology.

Among the ethnographic Ifugao three social statuses are recognized: the *kadangyan*, *natumok*, and *nawotwot*. These statuses are still recognized today even with the assimilation of the Ifugao into the market economy. The ranks were also mentioned in the Ifugao romantic tales, the *Hudhud*, which is assumed to be at least two centuries old (Lambrecht, 1967; Scott, 1994). The *Hudhud* refers to the wealthy

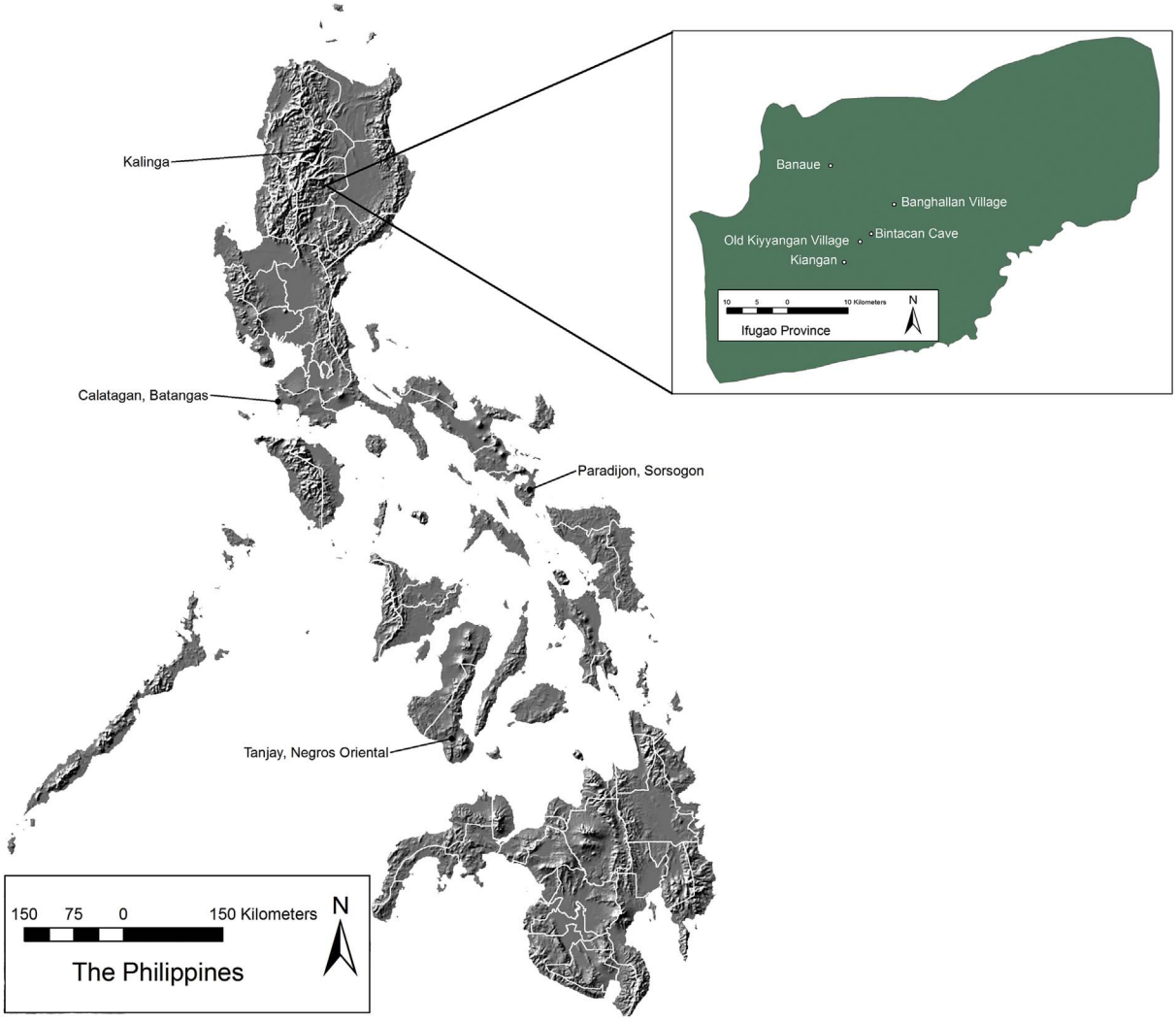

Fig. 1. Map of the Philippines, highlighting localities mentioned in the text. Inset: The Province of Ifugao, showing areas investigated by the Ifugao Archaeological Project.

members of the community as the kadangyan. A *kadangyan*'s status is based on the number of rice fields owned and can be achieved after sponsoring a series of public feasts that necessitate elaborate rituals and conspicuous feeding of non-*kadangyans* (Barton, 1922). In these feasts, pigs, carabaos (water buffalo), and chickens are sacrificed to ancestral spirits. Garments and adornments distinguish the *kadangyans*; males wear loincloths and wraparounds with accompanying belts with shell disks, gold earrings, and gold beads. The most crucial symbol is the headdress made of a hornbill's skull painted red “set off by kind of crescent of carabao horn, and a G-string worn like a turban” (Scott, 1994: 262). Female *kadangyan* wear a belt with tassels, gold earrings, and necklace of amber beads. They also wear strings of red and white beads in their hair.

Ethnographic reports on Ifugao *kadangyans* mirror the *Hudhud* (Barton, 1922, 1978; Scott, 1982). Although dwellings tend to be standardized in terms of general appearance (Lambrecht, 1929; Scott, 1994), a lounging bench (*hagabi*) can be seen under a *kadangyan*'s house. The *kadangyan* status is not political in nature; rather, it is more of a ritual and prestige rank.

Access to rice is an indicator of socio-economic status among the Ifugao (Brosius, 1988). *Kadangyans* eat rice all year round. Their status in the community is repeatedly validated through a series of feasts where rice, rice wine, and butchered animals are prepared and consumed. Carabaos are the most expensive ritual animals and rice wine is an important component of Ifugao rituals (Barton, 1922). Status is enhanced at these feasts and further advertised through the display of the carabao's skull and horns outside the sponsor's house. Those of the middle rank (the *natumok* or *tagu* are rice-land owners who did not go through prestige rites), have access to rice but tend to run out of it at the end of the agricultural year. The *natumok* then borrows rice from the *kadangyan* and needs to repay it double in the next harvest season. At the bottom of this hierarchy is the *nawotwot* who own very small rice fields or none at all. The rice fields are so important to the Ifugao that settlements are located near or within the fields (Lambrecht, 1929).

The *nawotwot* are considered root-crop eaters. Although sweet potatoes yield a higher nutritional value and caloric content, Ifugaos consider themselves poor if they consume sweet potatoes instead of rice (Brosius, 1988). More challenging to cultivate, rituals surround rice production in terraced fields, whereas sweet potatoes are grown in a straightforward manner in swiddens without any ceremonies. Acabado (2015: 96–97) also contends that rice produced in the terraces is not enough to feed the Ifugao populations, thus, rice became a prestige food. A landless *nawotwot* is only able to eat rice if she or he helps in the agricultural activities of the *kadangyan*. A wealthy *kadangyan* also works the field, but most of the farmers are *nowotwot* or *natumok/tagu*.

As noted above, and described in the succeeding sections, the late appearance of rice was accompanied by a dramatic increase in the presence of exotic goods – stoneware, porcelain, and glass and stone beads. Prestige fauna (domesticated pigs and water buffalo) also appeared during this period. Ethnographically, domesticated pigs (*Sus*

scrofa) and carabaos are only butchered during rituals and lavish feasts (Lapeña and Acabado, 2017). More importantly, carabaos can only be butchered during prestige-elevating rituals.

The introduction of extra-local wealth in the region preceded rice agriculture as various analyses, including macro- and microbotanical analyses of multiple soil columns and starch residue analyses of sherds recovered from OKV did not suggest presence of rice and rice-related weeds earlier than 1650 CE (Acabado, 2017). Once wet-rice was introduced to the region, an increase in social stratification ensued, which was based on the prestige associated with the production and consumption of rice, that has been documented ethnographically (Acabado, 2013; Conklin, 1980). However, we do not see associated increase in local ceramic specialization and standardization emerging with these political and subsistence shifts.

4. The Ifugao rice terraces

Information about the earliest contact with Europeans in the late 1700s in the Philippine Cordilleras is described in various ethnohistoric accounts (Antolin, 1970; Keesing, 1962; Scott, 1974, 1994) and tends to be recent compared to accounts of other ethnolinguistic groups in the Philippines (i.e. the Tagalogs [Plasencia, 1589] and the Visayas [Alcina, 1668]). Most of what we know of life in the Cordillera is based on 20th century ethnographic accounts (Barton, 1922, 1946, 1949, 1969; Cole, 1908, 1922; Dozier, 1966, 1967; Jenks, 1905; Vanoverbergh, 1929). There is also a dearth of Spanish description of Ifugao/Cordillera cultures prior to the 18th century. Our archaeological work in the region provides a significant contribution to this aspect of Philippine archaeology and has been an important supplement and challenge to ethnohistory.

The most controversial issue surrounding the Ifugao rice terraces is the origins of the agricultural features (Table 1). Barton (1919) and Beyer (1955) both argued that the terraces would have been constructed at least 2000 years ago. This proposition, however, has been questioned due to the absence of archaeological evidence that supports the long history model (Dozier, 1966; Keesing, 1962; Lambrecht, 1967; Acabado, 2009). Currently, archaeobotanical data (Table 2) and AMS dates (Table 3) recovered from the OKV support a much later shift to wet-rice cultivation (Fig. 2), as late as 1650 CE, an origin that coincided with the arrival of the Spanish in the northern Philippine lowlands (Acabado, 2017).

The Ifugao terraces are primarily used for rice cultivation and are still in use today. The terraces are constructed along steep slopes with either stone or mud walls, or a combination of both. The construction and maintenance of these terraces signify labor-intensive environmental modification and thus, necessitated enormous human-labor hours. Rice production and consumption forms the nexus of Ifugao social relationships. Indeed, the Ifugao customary wealth indicator is based on the rice land holdings of an individual and the person's ability to sponsor feasts – which requires the distribution of rice and consumption of rice wine.

Table 2
Pollen, phytolith, and starch evidence for taro, rice, and palms recovered from multiple trenches in OKV (+ = present; — = absent). All sherd residue analysis from cooking vessels did not provide any evidence for rice preparation and consumption at OKV. The predominance of palm could be from *Areca* nut for betel nut chewing. Analysis conducted by M. Horrocks (pollen, phytolith, and starch) (Horrocks, 2012, 2013) and M. Eusebio (sherd charred residue) (Eusebio et al., 2015).

Depth (cm)	Taro	Rice	Palm
0–10	—	—	+
10–20	—	—	+
20–30	—	—	+
30–40	—	+	+
40–50	—	+	+
50–60	+	—	+
60–70	+	—	+
70–80	+	+	+
80–90	+	+	+
90–100	+	—	+
100–110	+	—	+
110–120	+	—	+
120–130	—	—	+
130–140	—	—	+

Surrounding the irrigated rice terraces are swidden fields and managed forests. Acabado (2012a, 2015) argues that before the advent of a market economy in the region, swidden fields would have provided the carbohydrate requirements of Ifugao communities. His calculations (Acabado, 2015: 97) showed that, in the 1960s, the gross-total of rice harvested in the terraces was only able to support a quarter of the population's carbohydrate requirements. This estimate corroborates ethnographic information that wet-rice is reserved for the elite; non-elites rely on root crops produced in the swidden fields.

4.1. Investigations into the origins of Ifugao agricultural terracing

Archaeological investigations in the northern highland Philippines have been hampered by a dearth of archaeologists working in the region. Only four research projects have been carried out in the Philippine Cordilleras in the past 30 years (Acabado, 2009, 2015; Bodner, 1986; Canilao, 2011; Maher, 1973, 1984, 1981). Even the presence of the imposing rice terraces and their inscription to the UNESCO's World Heritage List did has not resulted in extensive archaeological investigations. However, ethnographic, ethnohistoric, linguistic, and literary-focused researches have made the Ifugao one of the most studied ethnolinguistic groups in the Philippines (Barretto-Tesoro, 2007; Barton, 1922, 1946, 1949, 1969, 1978; Blench and Campos, 2010; Campos, 2012; Conklin, 1967a, 1967b, 1980; Conklin, 2002; Dulawan, 1967, 2001; Dulawan, 2006; Lambrecht, 1929, 1955; Newell, 1957, 1969; Newell and Poligon, 1993; Scott, 1982, 1994; de Raedt, 1995; Roxas-Lim, 1973; Uy, 2003; Willcox, 1912). In the past three

Table 1
Age estimations proposed for the inception of the Ifugao Rice Terraces.
Adapted from Acabado, 2009.

Author	Dates	Evidence
Barton (1919) and Beyer (1955)	2000–3000 BP	Estimates of how long it would have taken the Ifugao to construct the elaborate terrace systems in the region
Keesing (1962) and Dozier (1966)	Post-1650 CE	Absence of Spanish documentary evidence describing the terraces before 1801; movements to upper elevation of Cordillera peoples were associated with the Spanish pressure
Lambrecht (1967)	Post-1650 CE	Lexical and linguistic evidence in analyzing Ifugao romantic tales (*Hudhud*); observed short duration of terrace building and concluded a recent origin of the terraces
Maher (1973: 52–55)	1493 CE to post-1950 1049 CE to 1431 CE	Radiocarbon dates from pond field and midden
Acabado (2009: 811; 2012b; 2017)	Post-1650 CE	Bayesian modeling of radiocarbon dates obtained from the Bocos terrace system, Banaue, Ifugao; archaeobotanical information from soils recovered from OKV (Banaue is located in the interior of the Cordillera and is ca. 40 km from OKV.)

Table 3
AMS dates obtained from the OKV between 2012 and 2015.

Depth (cm)	Lab Number	Location	Material/Trench	^{14}C BP	Cal. BP (2 σ)	Cal. CE (2 σ)	Context
30–40	Beta-356307	OKV	Organic sediment/8	190 ± 30	260–200	1640-post-1950	Rice field
50–60	UCIAMS-183276	OKV	Wood charcoal (*P. insularis*)/14	415 ± 15	510–469	1440–1480	Rice field
55–73	Beta-394185	OKV	Bone collagen/8	410 ± 30	530–470	1405–1445	Mortuary
60–70	UCIAMS-183272	OKV	Wood charcoal (*P. insularis*)/14	345 ± 15	477–317	1470–1633	Rice field
65–70	Beta-356306	OKV	Organic sediment/8	620 ± 30	680–620	1280–1390	Rice field
80–90	UCIAMS-183273	OKV	Wood charcoal (*P. insularis*)/14	570 ± 15	634–537	1315–1415	Rice field
80–90	Beta-394182	OKV	Bone collagen/8	600 ± 30	730–670	1265–1380	Mortuary
90–100	CIAMS-183274	OKV	Wood charcoal (*P. insularis*)/14	665 ± 15	669–564	1280–1385	Rice field
90–100	Beta-421036	OKV	Charcoal/14 (*P. insularis*)	660 ± 30	690–630	1280–1390	Rice field
90–100	Beta-421037	OKV	Potsherd residue/14	590 ± 30	610–550	1300–1415	Rice field
90–100	D-AMS 003446	OKV	Organic sediment/9	861 ± 25	899–700	1052–1250	Rice field
100–110	D-AMS 003447	OKV	Organic sediment/10 (fill)	1252 ± 37	1279–1075	672–876	Rice field
100–110	D-AMS 003448	OKV	Organic sediment/10 (dark midden soil)	292 ± 27	456–291	1495–1660	Rice field
100–110	Beta-356305	OKV	organic sediment/8	720 ± 30	810–750	1220–1280	Rice field
110–120	D-AMS 003445	OKV	Organic sediment/9	672 ± 28	676–561	1274–1390	Rice field
110–120	Beta-32953	OKV	Organic sediment/3	780 ± 30	741–669	1160–1260	Rice field
120–144	Beta-394184	OKV	Bone collagen/9	800 ± 30	767–675	1045–1220	Mortuary
130–140	Beta-329552	OKV	Organic sediment/3	770 ± 30	734–668	1050–1240	Rice field
150–160	Beta-329551	OKV	Organic sediment/3	1000 ± 30	967–799	900–1020	Rice field

decades, the field terraces, being the most visible evidence of human activity in Ifugao, became the focal point of archaeological investigations in the region (Acabado, 2003, 2009, 2010a, 2010b, 2012b, 2013, 2015, 2017; Maher, 1973, 1984, 1981).

As mentioned above, Barton (1919) and Beyer (1955) espoused the idea of a 2000–3000-year-old origin for the Ifugao rice terraces. This "long history" has become the accepted narrative memorialized in textbooks and national histories (Jocano, 2001; UNESCO, 1995). On the other hand, several scholars have proposed a more recent origin of the Ifugao rice terraces (Acabado, 2009; Dozier, 1966; Keesing, 1962; Lambrecht, 1967). Using evidence from lexical information and ethnohistoric documents, these studies suggest that the terraced landscapes of the Ifugao are the end-result of population expansion into the Cordillera highlands in response to Spanish colonization. Lowland-mountain contacts even before the Spanish arrival might have facilitated the movement of lowland peoples to the highlands when the Spanish established bases in their locales (Keesing, 1962).

Maher (1973) was the first to present archaeological data to consider the antiquity of the rice terraces – earlier scholars who debated the age of the terraces used history, linguistics, and epics. The four excavation areas he worked on were selected based on the following information: the importance of wet-rice agriculture, nature of drainage systems, and proximity to a water source and rice fields. He proposed that older fields were found near water sources within the boundaries of the drainage system, and older habitation sites were near the older fields. The four sites selected were found in different locations in relation to the drainage system. The first two sites were found "near the northwestern boundary of the Nabyun agricultural district in the upper reaches of its drainage system" (Maher, 1973:47). The third and fourth sites were "located near the present market and administrative town of Banaue in the heart of the great Banaue Valley … at the bottom of the valley" (Maher, 1973: 47).

During this field season, Maher only excavated the first three sites. At the first site, he excavated a house platform from which he dated charred remains of runo reeds to 205 BP ± 100 years (1645–1845 CE). The layer below the runo reeds was sterile clay. However, underneath

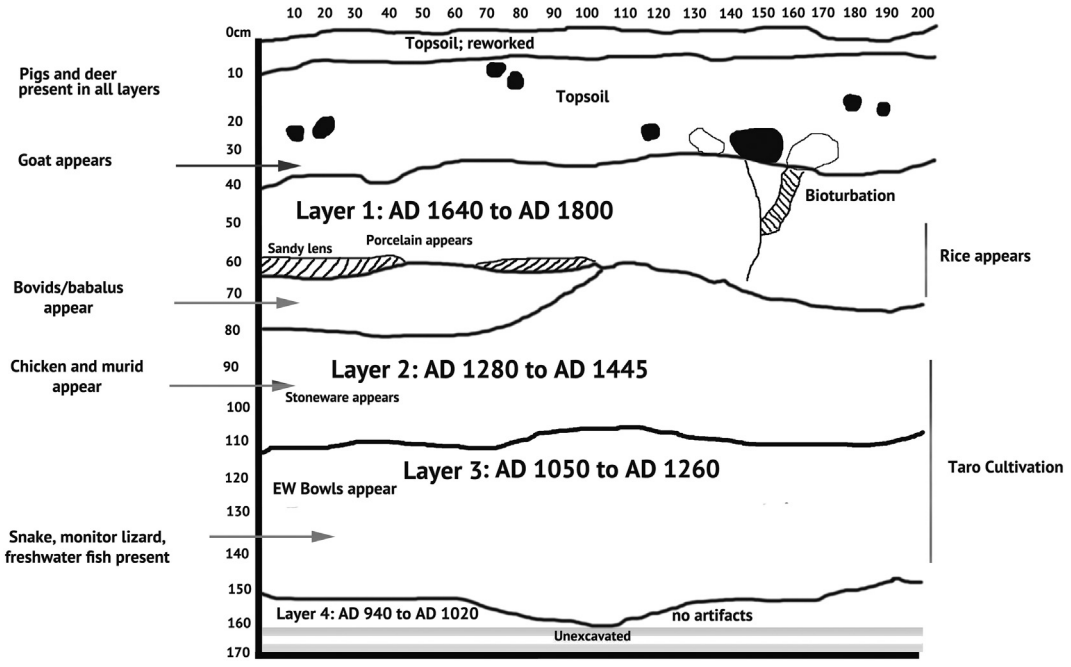

Fig. 2. South wall profile of Trench 3 showing radiocarbon dates and layers in relation to taro and rice cultivation and when animals first appeared in Kiyyangan.

Table 4
Radiocarbon dates obtained by Robert Maher and Harold Conklin from various sites in Ifugao.

Site/Locality	Depth (cm)	Lab #	Material	^{14}C BP	Cal. CE (2 σ – 95%) (recalibrated using IntCal13)	^{14}C Sample context	Reported by
If1 - Nabyun	91	GX0668	*M. sinensis*	205 ± 100	1493-post-1950	Pond-field	Maher, 1973
If2 - Nabyun	91	GX1900	No data	325 ± 110	1408-post-1950	House platform	Maher, 1973
If2 - Nabyun	90	GX1901	No data	695 ± 100	1052–1435	Midden	Maher, 1973
If2 - Nabyun	90	BX2184	No data	735 ± 105	1043–1413	Midden	Maher, 1973
If3 - Banaue	4.4	GX2183	No data	2950 ± 250	1867-540 BCE	House platform	Maher, 1973
Gawwa, Poitan	5	GX3138	No data	530 ± 140	1192–1792	Underground chamber	Maher, 1975
Gawwa, Poitan	5	GaK5238	No data	530 ± 100	1273–1631	Underground chamber	Maher, 1975
Lugu	No data	UGA2515	No data	395 ± 60	1430–1639	Terrace embankment post	Conklin, 1980
If20 - Banghallan	50	GaK6442	No data	890 ± 310	434–1647	Village edge	Maher, 1985
If20 - Banghallan	60	UGA1541	No data	1340 ± 375	176 BCE-1388 CE	Village edge	Maher, 1985

Table 5
TL dates obtained by Robert Maher from Bintacan Cave (1981) and OKV (1984).

Site	Level Info	TL Dates	Reported by
Bintacan Cave	Level F	1620 BP Alpha 476	Maher, 1981
Bintacan Cave	Level E	1420 BP (± 20%) Alpha 480	Maher, 1981
Bintacan Cave	Level C	760 BP (± 20%) Alpha 479	Maher, 1981
Old Kiyyangan Village	No data presented	820 BP Alpha 566	Maher, 1984
Old Kiyyangan Village	No data presented	720 BP Alpha 671	Maher, 1984

the sterile clay was an old rice field. At the second site, the stratigraphic profile was generally similar to the first site. However, the radiocarbon dates pointed to an earlier settlement date. Maher excavated under a house platform at the third site and obtained a date of 2950 BP ± 250. His excavation data support the existence of pre-contact settlements in the highlands, but did not discount the probable impact of Spanish presence, which could have affected rice-terrace building in Ifugao (Maher, 1973). As early as the 1970s, Maher hypothesized that the location of older terraces should be near drainage systems and the later ones should be at the peripheries, which has been supported by Acabado's (2009, 2010a, 2010b, 2015) work. Furthermore, it appears that Maher was excavating in an older midden deposit that was not associated with the house that was coeval with the wet-rice terraces. Maher (1973, 1975, 1984, 1985) and Conklin (1980) provided the earliest radiocarbon samples from the region (Tables 4 and 5), although caution is needed when using the dates as context and wood taxa were not explicitly described in reporting the determinations.

Recent work in the region started when Acabado (2009, 2010b) revived the model that the development of Ifugao agricultural terraces was a response to the presence of the Spanish in the northern Luzon lowlands. Following Keesing (1962), he suggests that lowland groups moved to the interior of the mountains to escape Spanish colonization. The ensuing upland population increase, along with knowledge of new varieties of rice and cultural practices, resulted in the adoption of wet-rice cultivation. The shift in subsistence technology supported the influx of population in a resource-limited region. Subsequently, the intensification of rice production eventually determined social division into elites, non-elites, and those in-between (Acabado, 2017). Acabado's model also suggests that prior to the 16th century, taro (*Colocasia esculenta*) was the primary cultivar in Ifugao (Acabado, 2012b; Eusebio et al., 2015) and that taro pondfields were pre-adapted to wet rice production following the introduction of wet-rice varieties ca. 1650 CE.

Intensive investigations in the OKV were initiated in 2012, when 19 radiocarbon dates were obtained. Of these 10 were bulk soil dates, five were wood charcoal (*Pinus insularis*), three were bone collagens, and one was sherd residue. These ^{14}C samples were obtained from multiple units, but these units had similar stratigraphy (Fig. 2). The use of bulk soil in archaeological chronological modeling has been critiqued since contamination is highly possible because of bioturbation and translocation of organic materials through water transport that could affect the final computed dates (Nowaczyk and Pazdur, 1990). To address this concern, the nine in situ radiocarbon dates and archaeobotanical specimens were used to anchor the bulk soil dates, which were initially utilized to provide environmental dates rather than to date archaeological events. Interestingly, the bulk soil dates in this study correspond neatly with the in situ radiocarbon dates. This could be due to rapid deposition and/or short time period in question.

Microbotanical samples were also obtained from the OKV, where *Oryza* species were documented in the 90 cm level of the column (Table 2). However, this low count suggests movement of phytoliths in the column could be due to water seepage (Fishkish et al., 2010; Madella and Lancelloti, 2012) as the phytoliths are smaller than 200 μm. In addition, none of the residue analyses of sherds (four) recovered from levels lower than 100 cm produced any evidence of the production and preparation of rice. Two of the sherds yielded starch signatures that are likely from the corm of taro (*Colocasia esculenta*) (Table 2).

As mentioned above, Acabado (2009, 2010a, 2010b, 2012b, 2015, 2017) argued that the shift to wet-rice production in Ifugao was much later than previously thought, after 1650 CE. The shift from taro to rice would have been similar to that observed among societies who have recently adopted wet- rice agriculture. Barton (2012) and Janowski (1995) illustrated a comparable process among the Kelabit of Borneo where the introduction of rice cultivation in the early 1900s led to an intensification of feasting and rituals. This also drastically changed the socio-political organization of the Kelabit as the intensive landscape modification for paddy field construction would have introduced the concept of private property. Harrison (1949: 142) mentioned that taro was the main cultivar in the interior of Borneo until the introduction of wet-rice, replacing taro and other root crops as starchy staples. The adoption of wet-rice in the region stimulated the emergence of a prestige economy, including in the Kelabit case, where highland groups actively converted excess rice into social “capital” (although social “potential” might be more accurate), through the purchase or trade of prestige items such as brass ornaments.

5. Specialization in pottery production

Craft specialization as an archaeological concept has received substantial attention since Evans (1978:115) provided an operational definition of the concept. As stressed in the preceding sections, craft specialization has become an invaluable tool for archaeologists trying to understand the relationship between economic systems and social organization (e.g. Brumfiel and Earle, 1987; Earle, 1981). For instance, Stark (1995) investigated the role of intensified agricultural production in the emergence of specialization in the village of Dalupa, Kalinga, Philippines.

Longacre (1981, 1999) pioneered the anthropological investigation of pottery production in the Philippines as part of the Kalinga Ethnoarchaeological Project (Longacre and Skibo, 1994a, 1994b; Longacre et al., 1988; Longacre and Hermes, 2015; Stark and Skibo, 2007).

Investigations included production organization, boundary maintenance through pottery forms and designs, material correlates of wealth, learning framework, residues and deposit analyses, technology, discarded ceramics, and trade (Aronson et al., 1994; Beck and Hill, 2007; Graves, 1994; Skibo, 1992; Stark, 1991a, 1991b, 1994; Stark et al., 2000; Trostel, 1994).

Although other approaches have been developed to understand standardization in pottery production (Benco, 1988; Berg, 2004; Blackman et al., 1993; Hagstrum, 1985; Kvamme et al., 1996; Rottländer, 1966), we chose to follow Longacre's work on Philippine pottery standardization and specialization, as it is more relevant to our investigation. Ethnographic Kalinga pottery is similar in form and function with those found in Ifugao (Solheim and Schuler, 1959). In addition, Kalinga and Ifugao are neighboring provinces. More importantly, Longacre's ethnoarchaeological work is most appropriate for our research since results of several studies on pottery production in the Philippines (Barretto-Tesoro, 2008a; Junker, 1999; Mijares, 2003) were always compared to Longacre's studies (Longacre et al., 1988).

Longacre (1999) and Longacre et al. (1988) analyzed whole cooking pots and flowerpots from two villages that had similar pottery traditions, such as hand modeling, coiling and scraping, and paddle and anvil, but varied in production organization. Potters in Kalinga, in north-central Philippines, produced pots on a part-time basis at the household level while potters in Paradijon in Bicol, made pots on a full-time basis. Both groups produced pots for the market. Using coefficients of variation of heights, widths, and aperture diameters of pots, Longacre proposed that pots with a higher degree of variation were mostly manufactured at the household level by part-time producers, whereas pots with a lower degree of variation were standardized and either produced by full-time potters or highly skilled potters. Measuring the co- efficient of variation as a statistical tool in determining the degree of pottery standardization, Longacre et al. (1988) set 6% and below for standardized pots and 12% and above as non- standardized.

Kvamme et al. (1996) pointed out potential limitations of using coefficients of variation in determining standardization due to the complex nature of the conditions by which pots are produced (i.e., expertise, demand, technology). The approach, however, provides a starting point to establish the degree of pottery standardization and specialization. For instance, Junker (1999) discovered that the production of domestic earthenware (globular cooking pots) in Tanjay, Central Philippines, became less variable in terms of technological and morphological attributes from 500 to 1600 CE. From 500 to 1000 CE, pots were produced by part-time household potters, similar to Kalinga pottery production. By the 15th to 16th centuries CE, sherds collected from different areas in lowland Tanjay and upland sites of various elevations and distances from Tanjay show standardization attributed to centralized, full-time pottery production similar to Paradijon pottery production. The coefficient of variation values were low compared to the sherds analyzed belonging to the earlier phase. Junker interpreted the change in pottery production from the sixth to 16th century as a shift from household production to full-time specialists production of cooking pots at centralized locations. Junker argued that this organization of production was linked to the need of lowland elites to control upland trade. The globular pots were exchanged with upland communities for forest products (metal ore, forest hardwood, and resins). These forest products were valued by foreign merchants who were bringing imported items, such as stonewares and porcelain, to Tanjay. Junker linked increasing full-time pottery production with increasing political centralization and social differentiation for Tanjay. She, however, recognized that variability in pottery production could occur across the Philippines. Thus, our paper discusses one of these variations, providing the first set of data for highland pottery production.

One archaeological study that demonstrates regional variability of pottery production around the same period is Barretto-Tesoro's (2008a) analysis of Calatagan pots. Dating to the 15th century CE, similar to the period Tanjay pots were manufactured by full-time specialists, the cooking pots Barretto-Tesoro analyzed correspond to the coefficient of variation of the Tanjay globular pots dating from 500 to 1000 CE, produced at the household level. Barretto-Tesoro investigated the same variables Junker studied such as temper, rim diameter, and vessel thickness; she likewise subscribed to the same coefficient of variation values that resulted from Longacre et al.'s (1988) work on Kalinga pots. It is worth noting that Barretto-Tesoro's (2008a) samples were obtained from mortuary contexts, while Junker's (1999) samples were from habitation sites.

Since Tanjay and Calatagan are both lowland coastal sites with varying pottery production modes, data from the highlands will provide another dimension to hypothesized regional variability.

We look at domestic earthenware vessels from the OKV in Ifugao, investigating the same metrical dimensions as Longacre et al., Junker, and Barretto-Tesoro did to understand the link between the social status and economic practices, specifically agricultural intensification and pottery production in Ifugao.

6. Pottery from the 2012 excavations

The 2012 field season of the Ifugao Archaeological Project focused on the Old Kiyyangan Village site. Five trenches and two test trenches were opened during the 2012 excavation (Fig. 3). All excavations used the arbitrary level method in increments of 10 cm. The selection of trench location was based on oral historical accounts that the center of the present- day rice field was the location of a village abandoned in the mid-1800s. Artifacts collected include pottery and porcelain sherds, beads, faunal remains, and fragmented human bones. An old irrigation ditch was also recorded. For this paper, we selected and analyzed earthenware sherds collected from Trench 3 since this was the deepest excavated at 160 cm below surface. The types of artifacts found in Trench 3 suggest that it is adjacent to an elite residence, as a small gold sheet and tradeware ceramics were recovered from the unit. Tradeware ceramics are used for rituals, particularly for the production of rice wine. We do not think that Trench 3 is within the house platform as there is no associated infant burial in the unit (Lauer and Acabado, 2015).

Based on the materials recovered from Trench 3, this area of the site is interpreted to have been the edge of a house, as it is Ifugao practice to sweep and discard refuse at the edge of house platforms (Maher, 1973). The sherds recovered from this trench appear to have been used on a daily basis for food preparation, although some of the utilitarian cooking pots were also used as infant burial jars as recovered from other trenches in the site. Many of the sherds had carbonized residues on both the exterior and interior surfaces, suggesting that vessels were used for cooking. Based on comparison with other excavation units, there appears to be no restriction on access to locally produced utilitarian pottery. Restrictions appear to be focused on extralocal wealth – imported glass beads and tradeware ceramics, which both appeared at ca. 1300 CE followed by a dramatic increase after 1650 CE (Acabado, 2017: 19–20).

Trench 3 started out as a 2 m × 2 m trench that was later extended to the southeast by 1 m × 2 m. Fifteen levels were recorded in Trench 3, which was found to be sterile at 140 cm to 160 cm below surface in a saprolytic C-Horizon (Fig. 3). Radiocarbon dates from bulk soil samples in Trench 3 and direct AMS dating of human remains and charred residue from other units (Acabado, 2017) indicate that the site was initially occupied from 900 CE (Fig. 2). Maher's (1984) excavation in Kiyyangan fit into the current dating of the site. The sherds' thermoluminescence dating produced dates of 1130 CE and 1230 CE. Based on the analysis of bulk soil samples, pollen, phytolith, and starch analyses from OKV, taro was cultivated from the 12th to the 17th centuries and rice appeared around 1650 CE. Taro cultivation and consumption around this time is supported by the organic residue analyses and archaeobotanical studies of Eusebio et al. (2015). These developments coincide with the appearance of certain animals associated with taro

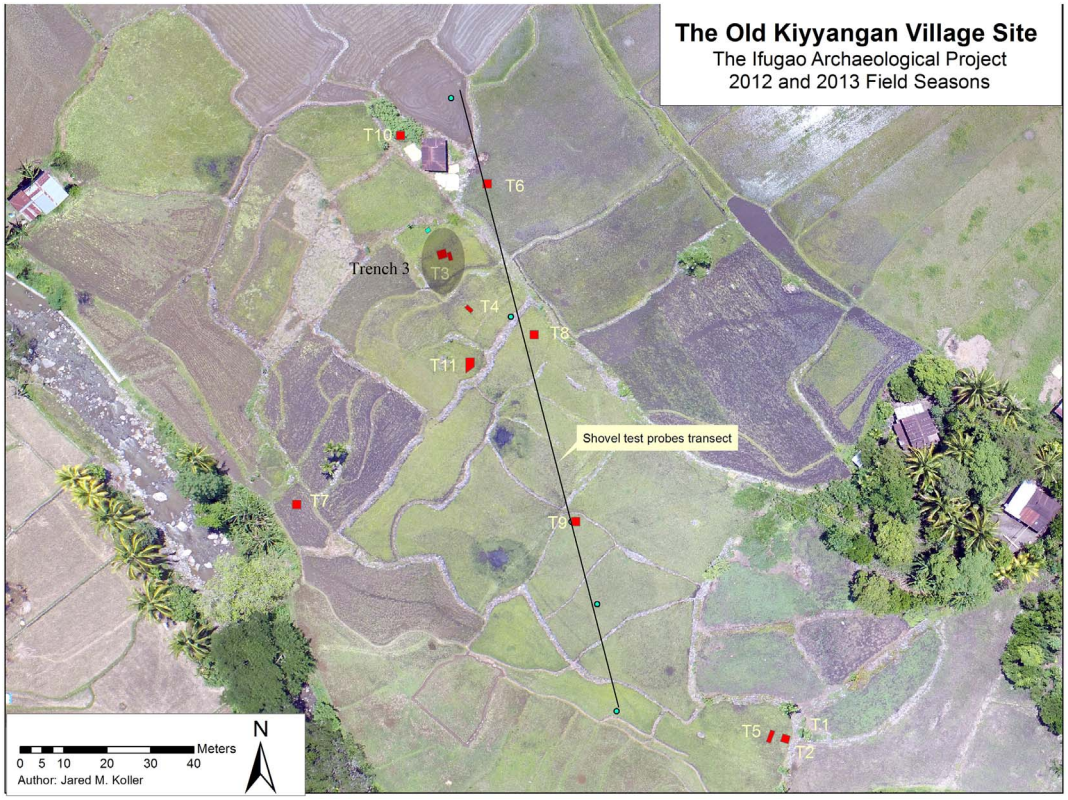

Fig. 3. The Old Kiyyangan Village Site with the excavated trenches and STPs during the 2012 and 2013 field seasons. The sherds analyzed in this paper were obtained from Trench 3.

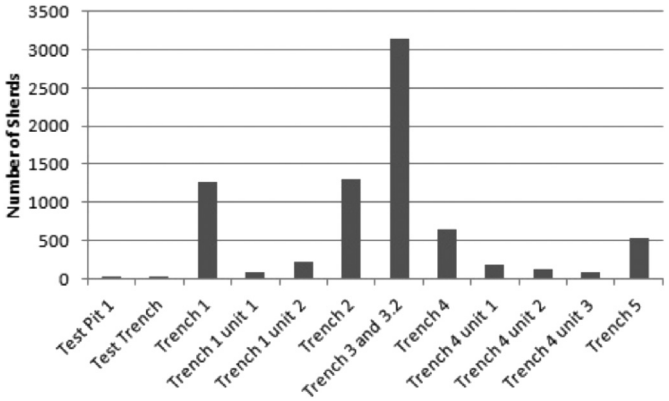

Fig. 4. Distribution of ceramic sherds across five trenches. Trench 3 was extended and that unit was labeled as Trench 3.2.

Fig. 5. An example of an earthenware bowl recovered from Trench 3. Compared to cooking pots and water jars, few sherds from bowls were recorded from Trench 3. This indicates that this form may not have been popular among the early inhabitants of OKV.

and rice fields such as snakes and monitor lizards in the lower levels and bovids in the upper layers. Between 1280 CE and 1390 CE, it is interesting to note that murids, which are commensal animals, were found associated with the early appearance of rice and imported stoneware sherds that belonged to jars (Fig. 4).

Recovered sherds included mouth rims, bowl rims, body sherds, bases, lid fragments, lid handles, and foot rings. Vessel forms included lids, bowls, cooking pots, and water jars. Cooking pots are smaller than water jars and water jars have thicker walls compared to cooking pots. Bowls, which might be copies of the Song and Ming tradewares, were also documented in Layer 3 (Fig. 5). Sherds from the upper levels tend to be sub-rounded due to weathering while sherds from Level 6 and below tend to be angular. Larger sherds with angular edges, mostly larger than 3 cm and one even 12 cm in length, were found in Level 10. Due to limitations in the field, we were not able to weigh the artifacts and, thus, are only relying on raw numbers of sherds.

7. Pottery production technology

The predominant artifact type recovered in OKV was utilitarian earthenware ceramics, which were distributed throughout the sequence. Since other types of information suggest landscape modification, increasing social differentiation, and a rapid shift to wet-rice cultivation, we investigate whether there was a corresponding change in ceramic production over time, as documented by Junker (1994, 1999) in Tanjay and Stark (1995) in Kalinga. By applying Longacre's (1999) threshold for standardization, we investigate the degree of pottery specialization present in the OKV by looking at utilitarian earthenware ceramics recovered from an elite household.

Everted rims are the dominant rim form present within in all pottery groups, with a few direct or flaring rims also present. Cooking pots and water jars were manufactured by coiling and modeling and paddle-and-anvil methods. Coiling appears as horizontal layered bumps around the pot or in the form of joints, layers of depressions and shallow corrugations (Fig. 6). Sherds with evidence of modeling tend to be lumpy and exhibit finger impressions on the interior. There were also rounded

Fig. 6. Interior of a cooking pot showing anvil impressions and evidence of joints between coils recovered from Layer 2. Coiling as a method of production was observed by Maher, 1984 as late as the 1970s in Ifugao. This implies that the recorded method of pottery production in the archaeological record continued into modern times.

impressions on the interior that could be anvil marks (Fig. 7).

Red-slipping and burnishing characterize most of the pots, although a small number of sherds exhibited black slip. Interior slipping covers the upper body of the pot just below the neck. When the exterior surface of a sherd has no evidence of slipping but the interior was slipped, fading, washing, or abrasion could have removed the exterior slip. Occasionally, burnishing is not visible on abraded slipped surface. Abrasion and heavy soot may also remove signs of burnishing and slipping.

Heavy usewear is visible on many of the sherds in the form of abraded exteriors and carbon deposits on the interiors even if the exteriors are relatively clean, with no evidence of burning. This suggests that something was burned inside the pot leaving the exterior undamaged. Some analyzed sherds showed no evidence of usewear; however, this does not necessarily mean that they were not used.

Due to exterior abrasions, the surface color of the pots varies to a large degree with red and light red being the dominant colors. Slip also shows fading. The faded slips and surface abrasions are probably due to frequent washing as most of the sherds recovered were most likely from utilitarian pots such as cooking pots and water jars. Abrasions usually produce coarse textures and the temper becomes visible on the surface. Temper consisted of sand with some sherds having very coarse sand visible on the surface. The material used as temper was uniform throughout the occupation layers suggesting that the materials used for production remained conservative. Pottery production technology also remained the same over time. Water jars have red slipped interiors and some have evidence of exterior abraded slips. Water jars tend to have larger diameters (> 20 cm) and less everted rims compared to cooking pots.

Water jars and cooking pots comprise most of the vessels examined

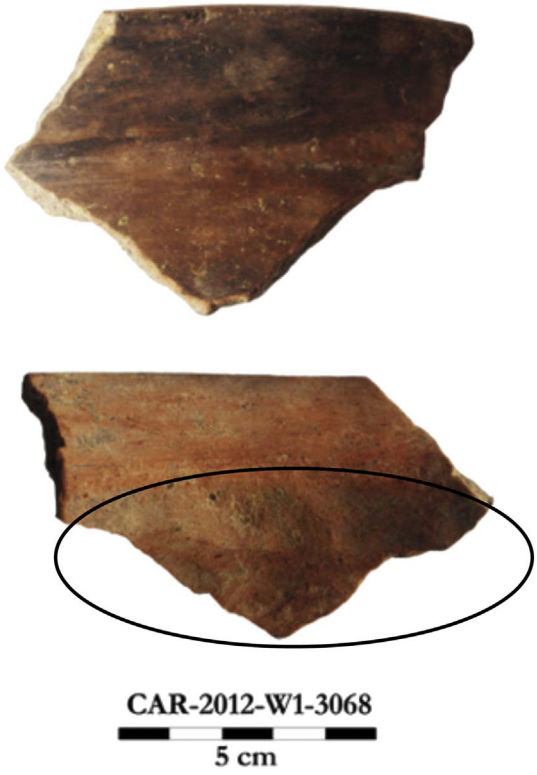

Fig. 7. Anvil impressions on the interior of a pot (bottom image) recovered from Layer 2. The paddle-and-anvil method of pottery production was also observed by Maher in the 1970s in Ifugao. Pottery production technology remained unchanged in Kiyyangan from ca. 1000 years ago to the present.

Table 6
Coefficients of variation of water jar lip thickness, rim diameter, and body sherd thickness (measurements all in cm). Dimensions were measured to the nearest 0.5 cm; rim diameter measurements were estimated using a sherd curvature chart. Rice appears in Layer 1 and Layer 3 is the oldest in the sequence.

Water jar lip thickness	N	Mean	Minimum	Maximum	Std dev.	Coef. var.
Layer 1 (Levels 1–7)	14	0.65	0.4	0.9	0.11	19.1
Layer 2 (Levels 8–11)	8	0.69	0.5	0.8	0.09	13.6
Layer 3 (Levels 12–15)	6	0.7	0.54	0.9	0.13	19.3
Water jar rim diameter	**N**	**Mean**	**Minimum**	**Maximum**	**Std Dev.**	**Coef. Var.**
Layer 1 (Levels 1–7)	17	18.3	13	26	3.21	17.6
Layer 2 (Levels 8–11)	7	20	18	25	2.38	11.9
Layer 3 (Levels 12–15)	6	20.83	10	27	6.77	32.5
Water jar body sherds thickness	**N**	**Mean**	**Minimum**	**Maximum**	**Std Dev.**	**Coef. Var.**
Layer 1 (Levels 1–7)	112	0.97	0.68	1.63	0.17	17.7
Layer 2 (Levels 8–11)	123	0.97	0.77	1.45	0.16	16.6
Layer 3 (Levels 12–15)	39	1.02	0.8	1.7	0.19	18.8

in this study. Tables 6 and 7 show the diagnostic sherds used to determine the degree of standardization observed in the OKV earthenware ceramics. As applied elsewhere (Longacre, 1991, 1995), we considered rim diameter and lip thickness to provide information about changes in the degree of standardization of vessels. We employed the use of

Table 7
Coefficients of variation of cooking pots lip thickness, rim diameter, and body sherd thickness (measurements all in cm). Dimensions were measured to the nearest 0.5 cm; rim diameter measurements were estimated using a sherd curvature chart. Rice appears in Layer 1 and Layer 3 is the oldest in the sequence.

Cooking pot lip thickness	N	Mean	Minimum	Maximum	Std dev.	Coef. var.
Layer 1 (Levels 1–7)	76	0.6	0.37	0.83	0.10	17.3
Layer 2 (Levels 8–11)	18	0.62	0.45	0.88	0.11	18.4
Layer 3 (Levels 12–15)	15	0.68	0.5	1	0.13	19.1
Cooking pot rim diameter	**N**	**Mean**	**Minimum**	**Maximum**	**Std Dev.**	**Coef. Var.**
Layer 1 (Levels 1–7)	71	14.65	7	23	3.6	24.5
Layer 2 (Levels 8–11)	16	19	12	32	4.59	24.2
Layer 3 (Levels 12–15)	13	16.85	10	24	3.76	22.3
Cooking pot body sherds	**N**	**Mean**	**Minimum**	**Maximum**	**Std Dev.**	**Coef. Var.**
Layer 1 (Levels 1–7)	100	0.54	0.31	0.78	0.10	18.8
Layer 2 (Levels 8–11)	70	0.61	0.4	0.79	0.09	15.8
Layer 3 (Levels 12–15)	15	0.6	0.44	0.78	0.11	18.9

coefficient of variation values in this investigation to provide us with an initial assessment of the relative dimensional uniformity of the ceramics investigated (larger values correspond to higher variation). Longacre et al. (1988) and Rice (1989) suggest a minimum of 30 samples for each class; although our sample size was small for several dimensions measured, in some cases our sample size is sufficient (e.g., for body sherd thickness) to propose general trends. Tables 6 and 7 outline the results of coefficient of variation analysis, which indicate that there is wide variation among the dimensions studied.

The water jar lip thickness ranged from 0.4 cm to 0.9 cm. As shown in Table 4, the lip thickness is fairly similar in all levels, but those rim sherds coming from Level 1 have the thickest lips. Similar to the pattern observed in the body thickness of the sherds, pots decreased in diameter from lower layers to upper layers (Fig. 8). The water jars with larger diameters of 17 cm to 19 cm were found in the lower layers (Levels 9 to 10) and these decreased through time from Layer 4 until the bottom part of Layer 1 at 16 cm to 12 cm. The rim diameter of water jars varied through the Layers with no observed significant differences. However, we argue that the increase in the minimum water jar rim dimension in Layer 2 could be evidence of an increase in lavish feasts and rituals, a relationship observed by Potter (2000: 486) in the American Southwest. This change was accompanied by increases in ritual fauna in OKV (Lapeña and Acabado, 2017). These feasts could have increased demands for liquid containers, which are larger in size compared to cooking pots. The coefficient of variation values for cooking pots remained high throughout the sequence, indicating low standardization through time, even when the shift to rice agriculture and population increase in OKV were documented (Layer 2).

Given that the number of potters and the frequency of production would affect the degree of specialization (Costin, 1991; Rice, 1991), our results suggest that pottery production in OKV involved a few potters making vessels infrequently for other households. In other words, there was a low degree of specialization of ceramic production. The CV values also appear to support arguments that handbuilt pots would presumably result in higher coefficients of variation because potters with limited mass-production technology are expected to produce more variable products compared to those who have access to standardized tools (Costin and Hagstrum, 1995: 632). Our OKV cooking pot data (Fig. 9) show higher coefficients of variation than those calculated by Longacre et al. (1988) using hand-built assemblages from Grasshopper Pueblo, but lower values compared to those that Costin and Hagstrum (1995) found for pots from Highland Peru.

In addition, ceramic dimension data from OKV indicate that there were probably no large workshops and no long-term apprenticeships in the community (Figs. 8 and 9). As Longacre (1999) has shown in Paradijon and Kalinga, large workshops and apprenticeship can lead to more standardization, but potter experience will also affect dimensional standardization, as observed by Underhill (2003) in Guizhou, China. Compared to the coefficient of variation percentages from ethnographic and archaeological samples (Table 8), it is clear that the OKV pots show very low degrees of standardization. The low degree of standardization of vessels from OKV suggests potters who occasionally made relatively small quantities of vessels for other households. Even with the emergence of wet-rice production (OKV Layer 1), coefficient of variation values remained high.

This study has shown that there is no detectable trend toward increase in degree of specialized production of pottery in OKV as evidenced from measures of dimensional standardization in the last

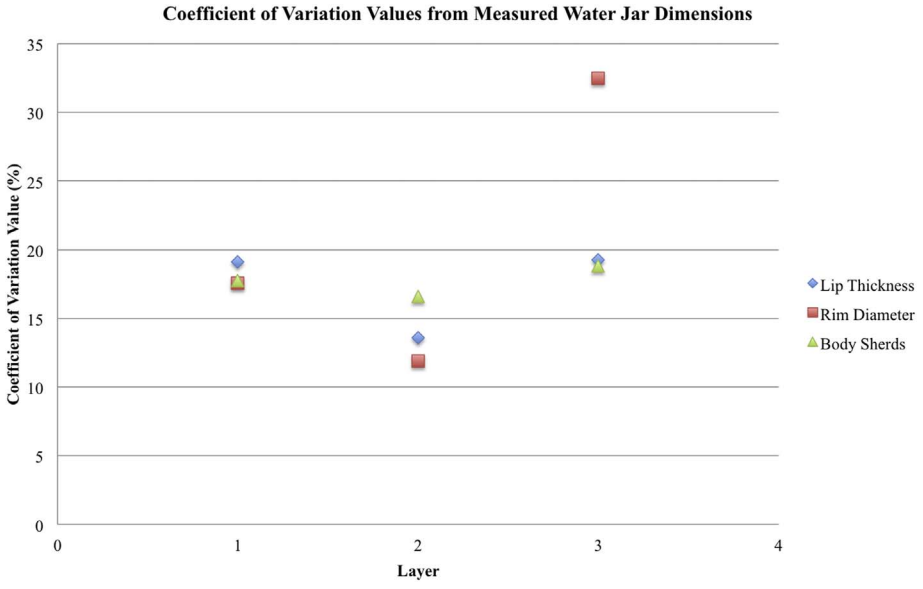

Fig. 8. Coefficient of variation values from measured dimensions of water jars from OKV. (Layer 1 is the latest layer; Layer 3 is the earliest with evidence of human occupation.)

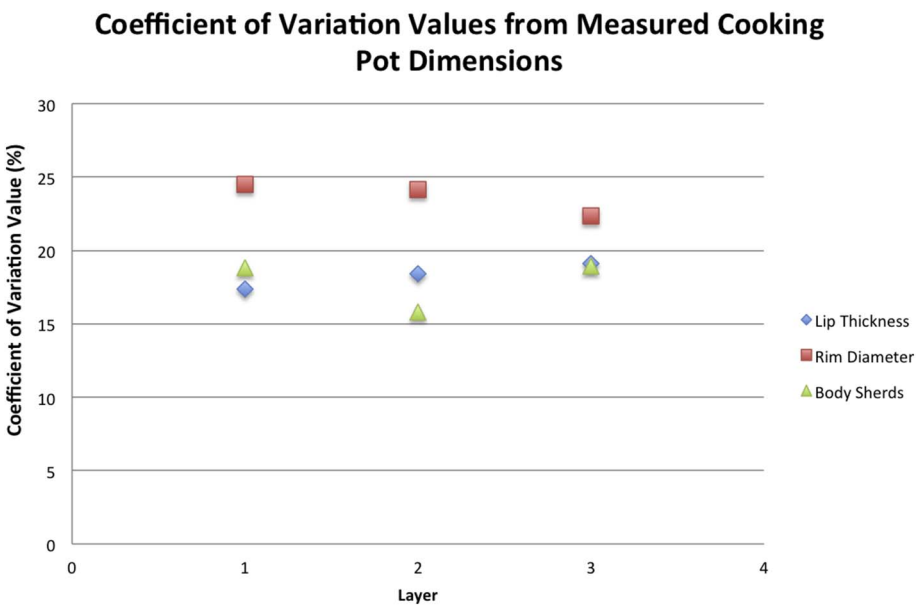

Fig. 9. Coefficient of variation values from measured dimensions of cooking pots from OKV. (Layer 1 is the latest layer; Layer 3 is the earliest level with evidence of human occupation.)

1000 years from 900 CE until after 1800 CE since CV values remained high (Tables 6 and 7). The Middle Phase (pre-contact and pre-wet rice period) actually provided lower CV values, than when we see the emergence of a more rigid social differentiation. Instead, it is likely that there was flexibility and overall stability in pottery production. The pots were most likely produced at the household level by part-time potters, as documented by Solheim and Schuler (1959) in a neighboring settlement of Munggayang in the 1950s, and continued to be manufactured in a similar manner when foreign ceramics reached the site. The introduction of rice agriculture did not precipitate a change in the technological production of cooking pots and water jars. These results could be a function of the low sample sizes, which we hope can be addressed by future research.

8. Implications of the study

Our investigations at OKV explored the model proposed by Junker (1994, 1999) in Tanjay, Negros, where she argued that elite efforts to control trade spurred competition and intensified ceramic production, thus resulting in high levels of specialization in the Tanjay polity. In addition, since intensification of agricultural production seems to play a major role in the degree of specialization, we also applied Stark's (1995) findings in Dalupa, Kalinga, where demographic pressure, technological change, and market demand motivated increases in pottery production. We applied the models above to our OKV samples, collected from Trench 3. Given our sample size, particularly as discussed by Rice (1989) and Longacre et al. (1988), there is low confidence that the patterns we find are representative of the real underlying population. However, the trends that we see suggest that the Ifugao case provides a different pattern relative to interpretations of craft specialization, elite control, and agricultural intensification than those observed in Tanjay and Kalinga.

The coefficient of variation values obtained from the OKV cooking pots and water jars provide general trends regarding labor investment, standardization, and degrees of specialization in pre-Hispanic Ifugao and the relationship between ceramic specialization and the emergence of wet-rice agriculture. It appears that there was no significant change in the degree of ceramic specialization in the OKV, at least for the contexts we investigated. Comparable to ethnographic and ethnohistorical observations regarding Ifugao social organization, it is unlikely that the elite controlled the production and distribution of utilitarian earthenware pots, in contrast to the scenario proposed by Junker (1994, 1999). It appears that the political economy model put forth by Junker (1994) in Tanjay in the Central Philippines, where pottery production appears to have become increasingly controlled by the political and economic elites from the 10th to the 16th centuries, represents a different pattern than in the northern highland Philippines. As Junker (1994) hypothesized, the increasing degree of centralization of ceramic production at the center of Tanjay was likely a result of concentrations of specialists. This was further supported by Niziolek's (2011, 2013) geochemical analysis which showed that both specialized (possibly some attached) production was taking place in Tanjay, along with

Table 8
Coefficients of variation of cooking pots from various sites. n/a = not available to authors.

	Lip thickness	Rim diameter	Body thickness	Context
OKV Layer 1 (late)	17.3	24.5	18.8	Archaeological
OKV Layer 2 (middle)	18.4	24.2	15.8	Archaeological
OKV Layer 3 (early)	19.1	22.3	18.9	Archaeological
Calatagan small	10.12	12.1	25	Archaeological
Calatagan medium	13.94	7.8	15.5	Archaeological
Calatagan large	12.56	8.1	18.8	Archaeological
Tanjay Aguilar Phase	n/a	11.3	n/a	Archaeological
Tanjay Osmeña Phase	n/a	0.06	n/a	Archaeological
Kalinga Vegetable medium	n/a	12.4	n/a	Ethnographic
Kalinga Rice medium	n/a	12.5	n/a	Ethnographic
Paradijon small-medium	n/a	4.5	n/a	Ethnographic
Paradijon medium	n/a	4	n/a	Ethnographic
Paradijon medium-large	n.d.	4.9	n.d.	Ethnographic

small-scale household production using more local materials.

In OKV, however, we do not see the same pattern of standardization even with the appearance of increasing social differentiation. It appears that other aspects of production remained under the control of the socio-economic elites in Ifugao, as ethnographic observations suggest. Instead of controlling pottery production, the possession of rice fields and control over rice production and consumption has been documented to be a source of a *kadangyan* status and instrumental to an Ifugao's social being (Brosius, 1988).

The shift to wet-rice cultivation at ca. 1650 CE and subsequent intensification of rice production in OKV did not result in a high degree of specialization of ceramic production. Most households at OKV were probably spending significant amount of time with farming (wet-rice and swidden field) activities, with just a few households making vessels occasionally in each period. Compared to Stark's (1995: 215) findings from Dalupa and Dangtalan, Kalinga, the utilitarian pots from OKV provided coefficient of variation values that characterize low degrees of specialization. Although the appearance of wet-rice coincided with increasing social differentiation, it appears that pottery production did not significantly affect the degree of pottery specialization at OKV. The high ceramic diversity suggests that several independent households continued to produce vessels, throughout the three phases investigated. These initial results suggest that even with intensified wet-rice production, a low degree of ceramic specialization continued to be the norm.

The coefficient of variation values suggest that the context of production of the earthenware pots recovered from OKV was the household, involving independent potters in the community and/or adjacent villages. There is no restriction to the acquisition of utilitarian pottery products, as supported by uniform distribution of utilitarian pottery in all of the excavation units. We do not think that earthenware pots were being exchanged from relatively distant villages since we have recovered an anvil in OKV and the neighboring village of Munggayang is ethnographically known as a pottery-making village. Thus, earthenware pots from OKV were likely produced by independent potters, within a domestic setting, possibly by family members or a group of related individuals, similar to the Munggayang (Solheim and Schuler, 1959) and Kalinga (Longacre, 1999) pottery-making traditions.

As part-time producers, OKV potters would have been engaged in subsistence activities, particularly paddy rice cultivation and swidden field management. Pottery production, thus, would have been by demand and seasonal – during the rice fallow period. The findings and interpretations detailed in this section suggest pottery production and distribution did not seem to play a role in elite control production and access to goods, but other materials – such as the documented imported goods (tradeware ceramics and beads) – were evidently being controlled by the Ifugao elite.

As such, Ifugao social status was directly tied to an individual's ability to obtain foreign goods, which was enabled by the control of wet-rice production. As mentioned above, tradeware ceramics appeared at the same time as the imported glass beads recovered from infant burials. Tradeware ceramics that made their way into the mountains were all jar vessels used for the production of rice wine; to date, there is no archaeological evidence for stoneware and porcelain plates and bowls in OKV – which is supported by oral historical information. However, the early inhabitants of OKV could have had exposure to bowls to be able to copy them in earthenware form. These exotic goods, coupled with the shift to wet-rice agriculture became the items that fuelled the prestige-based economy in Ifugao. Thus, we hypothesize that wet-rice production and consumption and its by-products (such as rice wine), were restricted in terms of access, circulation, and consumption. Similar to ethnographic observations (Barton, 1978), feasts and rituals became venues where the Ifugao elite displayed their status through conspicuous consumption of rice, rice wine, and valued animals (domesticated pigs and carabao). Tradeware ceramics and beads recovered from the OKV also suggest that only a few households had access to these imported goods. Comparisons of infant burials indicate that those units that showed evidence of access to the extralocal wealth maintained their status in the community as wealthy or prestigious households. Burials that did not have these materials were presumably restricted or the family did not have the capacity to access such goods. The earliest evidence of imported glass beads is dated to about 1300 CE. Thus, social differentiation is evident even before the shift to wet-rice cultivation, but intensified with the shift to a more intensive form of agricultural production.

Junker argued that one impetus for the control of pottery production in Tanjay was to create surplus for upland trade so that forest products could be accessed in exchange for foreign ceramics through long-distance trade (Junker, 1990, 1993). In order to maintain status, it was important for elites to monopolize foreign trade and control the manufacture of earthenware pots connected to it through centralized and specialized production. Junker proposed that Tanjay was not only producing cooking pots but also fancy earthenware to be exchanged with upland communities. However, this control is only one part of how “chiefs” at Tanjay may have tried to maintain or enhance their status.

Upland groups may have had a high degree of control over with whom they traded and were not necessarily controlled by lowland polities. Niziolek's (2011, 2013) work seems to indicate that mountain groups near Tanjay may not have been getting their ceramics from the coastal polity since none of the upland samples tested using compositional analysis matched the chemical signatures of pieces (or clays) from Tanjay.

In Ifugao, pottery continued to be produced by several independent households even with the shift to wet-rice production. As a prestige food, rice was produced by the Ifugaos for ritual and feasting purposes, rather than as a product for economic transactions with lowlanders. Among the Ifugao, maintaining status was aimed at controlling rice production and consumption that led to the intensification of rice production as observed in the rapid modification of the Ifugao landscape in the last 300 years. The intensified rice production, however, did not lead to centralized pottery production where pottery specialists were concentrated in one area producing pots with increasingly standardized dimensions. The pots produced were mostly for personal domestic use and were neither used as a commodity in exchange of rice or as rice storage containers. Although imported stoneware jars displayed the status of owners, what was essential in Ifugao rituals was rice wine contained in these jars. Locally-produced earthenware jars are porous and do not hold liquids as well as the imported jars.

9. Conclusion

Our results do not indicate a high degree of ceramic standardization and we contend the control of local pottery production was not critical to achieve and maintain elite status in Ifugao. Dimensional aspects of pottery in the Old Kiyyangan Village from the 10th century CE to the 1800s displayed a high degree of variation indicating that pottery was produced by a few households for local consumption. Based on our findings, we hypothesize increases in social inequality, including the strengthening of elite power in the Ifugao area, were not linked to an increase in ceramic specialization as indicated by an increase in dimensional standardization. Even with the relatively small samples used in our analyses, the data still support the observation that there is very little change in ceramics despite evidence for changes in subsistence and hypothesized accompanying changes in social stratification.

Throughout the whole sequence observed in OKV, it is apparent that elite control did not extend to pottery production and distribution. Solheim and Schuler (1959) documented that a neighboring village (Munggayang) was once a pottery-producing center in the locale, but production ceased when metal pans were introduced to the region in the 1950s. Results of the descriptive statistics and coefficient of variation analyses suggest that the pottery producers in the OKV (and Mungayang, as documented ethnographically) were part-time

producers. It is likely that OKV households obtained their vessels from locally-produced pots or from the neighboring Munggayang village, but with the absence of elemental studies that could establish production locales and source materials, statistical analyses presented here are sufficient to conclude that there was a low degree of specialization in the region.

Acabado's (2017) recent work has maintained that the shift to wet-rice cultivation that coincided with the arrival of the Spanish in the lowland northern Philippines provided the structuring mechanism that allowed the Ifugao to resist Spanish conquest. As supported by ethnographic descriptions of the Kelabit in Borneo, where the shift to wet-rice agriculture initiated a prestige economy and emergent ranking, the ability of the Ifugao to control access to rice, rice lands, lavish feasts and rituals, as well as exotic materials, became the basis for social differentiation in OKV. Our investigations provide another dimension to the various ways that people respond to subsistence shifts and culture contact.

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References

Acabado, S.B., 2003. Land Use and Agricultural Intensification: A GIS-Based Analysis of the Landscape of Ifugao, Northern Philippines. Department of Anthropology, University of Hawaii (MA Thesis).
Acabado, S.B., 2009. A Bayesian approach to dating agricultural terraces: a case from the Philippines. Antiquity 83, 1–14.
Acabado, S.B., 2010a. The Archaeology of the Ifugao Agricultural Terraces: Antiquity and Social Organization. University of Hawaii (Ph.D. Dissertation).
Acabado, S.B., 2010b. Landscapes and the archaeology of the Ifugao agricultural terraces: establishing antiquity and social organisation. Hukay 15, 31–60.
Acabado, S.B., 2012a. The Ifugao agricultural landscapes: complementary systems and the intensification debate. J. Southeast Asian Stud. 43 (3), 500–522.
Acabado, S.B., 2012b. Taro before rice terraces: implications of radiocarbon determinations, ethnohistoric reconstructions, and ethnography in dating the Ifugao terraces. In: Spriggs, M., Addison, D., Matthews, P.J. (Eds.), Irrigated Taro (*Colocasia esculenta*) in the Indo-Pacific: Biological, Social and Historical Perspectives. Senri Ethnological Studies, vol. 78. National Museum of Ethnology, Osaka, pp. 285–305.
Acabado, S.B., 2013. Defining Ifugao social organization: “house”, field, and self-organizing principles in the Northern Philippines. Asian Perspect. 52 (2), 161–189.
Acabado, S.B., 2015. Antiquity, Archaeological Processes, and Highland Adaptation in the Northern Highland Philippines: The Ifugao Rice Terraces. Ateneo de Manila University Press, Quezon City.
Acabado, S.B., 2017. The archaeology of pericolonialism: responses of the “unconquered” to Spanish conquest and colonialism in Ifugao, Philippines. Int. J. Hist. Archaeol. 21 (1), 1–26.
Alcina, F.S., 1668. The Muñoz text of Alcina's history of the Bisayan Islands (Historia de las Islas e Indios de las Bisayas) (1960). In: Philippine Studies Program. University of Chicago, Chicago.
Antolin, F., 1970. Notices of the pagan Igorots in 1789. Asian Folk. Stud. 19, 177–249.
Arnold, J., Munns, A., 1994. Independent or attached specialization: the organization of shell bead production in California. J. Field Archaeol. 21 (4), 473–489.
Aronson, M., Skibo, J.M., Stark, M.T., 1994. Production and use technologies in Kalinga pottery. In: Longacre, W.A., Skibo, J.M. (Eds.), Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory. Smithsonian Institution, Washington, pp. 83–111.
Bacus, E.A., 1996. Late prehistoric chiefly polities in the Dumaguete-Bacong area and central Philippine Islands. Philippine Q. Cult. Soc. 24, 5–58.
Bacus, E.A., 1999. Prestige and potency: political economies of orotohistoric Visayan polities. In: Bacus, E., Lucero, L.J. (Eds.), Complex Polities in the Ancient Tropical World, Archeological Papers of the American Anthropological Association Number 9. American Anthropological Association, Arlington, pp. 67–87.
Bacus, E.A., 2002. Accessing prestige and power: women in the political economy of protohistoric and early Visayan polities. In: Nelson, B.S., Rosen-Ayalon, M. (Eds.), In Pursuit of Gender: Worldwide Archaeological Approaches. AltaMira Press, Walnut Creek, pp. 307–322.
Barretto-Tesoro, G., 2007. Symbols of an Ifugao thanksgiving ritual. Test Pit 11, 13–14.
Barretto-Tesoro, G., 2008a. Identity and reciprocity in 15th Century Philippines. In: British Archaeological Reports. BAR International Series 1813 John and Erica Hedges Ltd., Oxford.
Barretto-Tesoro, G., 2008b. Where are the datu and catalonan in early Philippine societies? Investigating status in Calatagan. Philippine Q. Cult. Soc. 36, 74–102.
Barretto-Tesoro, G., 2009. Expressions of status in prehispanic Philippines. In: Brown Bag Lecture Series. University of Michigan Museum of Anthropology.
Barretto-Tesoro, G., 2013. Ang inskripsyon sa binatbat na tanso ng Laguna: Isang pag-papakahulugan sa perspektiba ng arkeolohiya. In: Peñalosa, C.V., Salazar, Z.A. (Eds.), Ang Saysay ng Inskripsyon sa Binatbat na Tanso ng Laguna. BAKAS and Pila Historical Society Foundation, Inc., Quezon City and Pila, pp. 89–111.
Barton, R.F., 1919. Ifugao Law. 15. University of California Publications in American Archaeology and Ethnology, pp. 1–186.
Barton, R.F., 1922. Ifugao Economics. 15(5). University of California Publications in American Archaeology and Ethnology, pp. 385–446.
Barton, R., 1938. Philippine Pagans: the Autobiographies of Three Ifugaos. Routledge, London.
Barton, R.F., 1946. The Religion of the Ifugaos. American Anthropologist New Series Memoir Series No. 65, vol. 48 American Anthropological Association, Menasha, Wisconsin.
Barton, R.F., 1949. The Kalingas. University of Chicago Press, Chicago.
Barton, R.F., 1955. The mythology of the Ifagao. Memoir of the Am. Folk. Soc. 46, 1–244.
Barton, R.F., 1969. Ifugao Law. University of California Press, Berkeley.
Barton, R.F., 1978. The Half-Way Sun: Life Among the Headhunters of the Philippines. AMS Press, New York.
Barton, H., 2012. The reversed fortunes of sago and rice, *Oryza sativa*, in the rainforests of Sarawak, Borneo. Quat. Int. 249, 96–104.
Beck, M.E., Hill Jr., M.E., 2007. Midden ceramics and their sources in Kalinga. In: Skibo, J.M., Graves, M.W., Stark, M.T. (Eds.), Archaeological Anthropology: Perspectives on Method and Theory. The University of Arizona Press, Tucson, pp. 111–137.
Benco, N.L., 1988. Morphological standardization: an approach to the study of craft specialization. In: Kolb, C., Lackey, L.M. (Eds.), A Pot for All Reasons: Ceramic Ecology Revisited. Laboratory of Anthropology, Temple University, Philadelphia, pp. 57–72.
Bentley, G.C., 1986. Indigenous states of Southeast Asia. Annu. Rev. Anthropol. 15, 275–305.
Berg, I., 2004. The meanings of standardisation: conical cups in the late Bronze Age Aegean. Antiquity 78, 74–85.
Beyer, H.O., 1955. The origins and history of the Philippine rice terraces. In: In Proceedings of the Eighth Pacific Science Congress, 1953. National Research Council of the Philippines, Quezon City.
Blackman, J., Stein, G.J., Vandiver, P.B., 1993. The standardization hypothesis and ceramic mass production: technological, compositional and metric indexes of craft specialization at Tell Leilan, Syria. Am. Antiq. 58, 60–80.
Blanc-Szanton, C., 1990. Collision of cultures: historical reformulations of gender in the lowland Visayas, Philippines. In: Atkinson, J.M., Errington, S. (Eds.), Power and Difference. Gender in Island Southeast Asia. Stanford University Press, Stanford, pp. 345–383.
Blench, R., Campos, F., 2010. Recording oral literature in a literate society: a case study from the Northern Philippines. In: Turin, M., Gunn, I.I. (Eds.), Language Documentation and Description. Special Issue: Oral Literature and Language Endangerment, vol. 8. Hans Rausing Endangered Languages Project, Department of Linguistics, School of Oriental and African and Studies, London, pp. 49–65.
Bodner, C., 1986. On the Evolution of Agriculture in Central Bontoc. PhD Dissertation. University of Missouri-Columbia.
Brill, R., Tong, S., Dohrenwend, D., 1991. Chemical analysis of some early Chinese glasses. In: Brill, R., Martin, J. (Eds.), Scientific Research in Early Chinese Glass: Proceedings of the Archaeometry of Glass Sessions of the 1984 International Symposium on Glass Beijing. The Corning Museum of Glass, Corning, New York, pp. 21–26 September 7, 1984.
Brosius, J.P., 1988. Significance and social being in Ifugao agricultural production. Ethnology 27, 97–110.
Brumfiel, E.M., Earle, T.K., 1987. Specialization, exchange, and complex societies: an introduction. In: Brumfiel, E., Earle, T.K. (Eds.), Specialization, Exchange and Complex Societies. Cambridge University Press, Cambridge, pp. 1–9.
Campos, F.Z., 2012. A Study of the Musical Instruments of Ifugao in the Cordillera Region,

Northern Philippines. Master's Thesis. The University of Hong Kong.
Canilao, M.A., 2011. Of Gold, Spanish Conquistadors, and Ibaloi Generational Memory. Cordillera Studies Center, University of the Philippines-Baguio, Baguio City, Philippines.
Carter, A., Dussubieux, L., Beavan, N., 2015. Glass beads from 15th–17th century jar burial sites in Cambodia's Cardamom Mountains. Archaeometry 58, 401–412.
Childe, V.G., 1936. Man Makes Himself. Free Press, New York.
Clark, J., 1995. Craft specialization as an archaeological category. In: Research in Economic Anthropology. 16. pp. 267–294.
Clark, J., Parry, W.J., 1990. Craft specialization and cultural complexity. In: Isaac, B.L. (Ed.), Research in Economic Anthropology. vol. 12. JAI Press, Greenwich, Conn, pp. 237–346.
Cobb, C.R., 1993. Archaeological approaches to the political economy of nonstratified societies. Archaeol. Method Theory 5, 43–100.
Cobb, C.R., 1996. Specialization, exchange, and power in small-scale societies and chiefdoms. Res. Econ. Anthropol. 17, 251–294.
Cole, F.C., 1908. The Tinggian. Philipp. J. Sci. 3, 197–213.
Cole, F.C., 1922. The Tinguian: Social, Religious, and Economic Life of a Philippine Tribe. 209(14). Field Museum of Natural History Anthropological Series Publication, pp. 231–442.
Conklin, H.C., 1967a. Ifugao ethnobotany 1905–1965: the 1911 Beyer-Merrill report in perspective. Econ. Bot. 21, 243–272.
Conklin, H.C., 1967b. Some aspects of ethnographic research in Ifugao. Trans. N. Y. Acad. Sci. 30, 99–121 Series II.
Conklin, H.C., 1980. Ethnographic Atlas of Ifugao: A Study of Environmental, Cultural, and Society in Northern Luzon. Yale University Press, New Haven.
Conklin, J.M., 2002. An Ifugao Notebook. Self-published.
Costin, C., 1986. From Chiefdom to Empire: Ceramic Economy Among Prehispanic Wanka of Highland Peru. Ph.D. Dissertation. University of California, Los Angeles.
Costin, C., 1991. Craft specialization: issues in defining, documenting, and explaining the organization of production. In: Schiffer, M.B. (Ed.), Archaeological Method and Theory. vol. 3. The University of Arizona Press, Tucson, pp. 1–56.
Costin, C., 2001. Craft productions systems. In: Feinman, G., Price, T.D. (Eds.), Archaeology at the Millennium: A Sourcebook. Springer, New York, pp. 273–327.
Costin, C., Hagstrum, M., 1995. Standardization, labor investment, skill, and the organization of ceramic production in late prehispanic highland Peru. Am. Antiq. 60 (4), 619–639.
Cross, J.R., 1993. Craft specialization in nonstratified societies. Res. Econ. Anthropol. 14, 61–84.
Crumley, C., 1995. Heterarchy and the analysis of complex societies. In: Crumley, C.L., Levy, J.E., Ehrenreich, R.M. (Eds.), Heterarchy and the Analysis of Complex Societies. 6(1). Archeological Papers of the American Anthropological Association, pp. 1–5.
Dozier, E.P., 1966. Mountain Arbiters: The Changing Life of a Philippine Hill People. The University of Arizona Press, Tucson.
Dozier, E.P., 1967. The Kalinga of Northern Luzon, Philippines. Holt, Rinehart and Winston, New York.
Dulawan, L.S., 1967. The Ifugaos. Unitas 40, 4–52.
Dulawan, L.S., 2001. Ifugao: Culture and History. National Commission for Culture and the Arts, Manila.
Dulawan, M.B., 2006. The Ifugao. National Commission for Culture and the Arts, Manila.
Earle, T., 1981. CA comment on 'evolution of specialiced pottery production: a trial model' by Prudence Rice. Curr. Anthropol. 22, 230–231.
Eusebio, M.S., Ceron, J.R., Acabado, S.B., Krigbaum, J., 2015. Rice pots or not? Exploring ancient Ifugao foodways through organic residue analysis and palaeobotany. Natl. Mus. Cult. Herit. J. 1 (1), 11–20.
Evans, R., 1978. Early Craft Specialization: An Example for the Balkan Chalcolithic. In: Redman, C.L., Berman, M.J., Curtin, E., Langhorne Jr.W., Versaggi, N., Wanser, J. (Eds.), Social Archaeology: Beyond Subsistence and Dating. Academic Press, New York, pp. 113–129.
Fishkish, O., Ingwersen, J., Lamers, M., Denysenko, D., Streck, T., 2010. Phytolith transport in soil: a field study using flourescent labelling. Geoderma 157 (1–2), 27–36.
Frank, A.G., Gills, B.K. (Eds.), 1993. The World System: Five hundred Years or Five Thousand? Routledge, London.
Fuxi, G., 2009. Origin and evolution of ancient Chinese glass. In: Fuxi, G., Brill, R., Shoutun, T. (Eds.), Ancient Glass Research Along the Silk Road. World Scientific, Singapore, pp. 1–40.
Graves, M.W., 1994. Kalinga social and material culture boundaries: a case of spatial convergence. In: Longacre, W.A., Skibo, J.M. (Eds.), Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory. Smithsonian Institution Press, Washington DC, pp. 13–49.
Hagstrum, M.B., 1985. Measuring prehistoric ceramic craft specialization: a test case in the American southwest. J. Field Archaeol. 12, 65–75.
Harrisson, T., 1949. Notes on some nomadic Punans. Sarawak Mus. J. 5, 130–146.
Horrocks, M., 2012. Plant Microfossil Analysis of Archaeological Samples from Ifugao, Philippines. Unpublished report. National Museum of the Philippines, Manila.
Horrocks, M., 2013. Plant Microfossil Analysis of Archaeological Samples from Trenches 6 and 8, Ifugao, Philippines. Unpublished report. National Museum of the Philippines, Manila.
Janowski, M., 1995. The hearth-group, the conjugal couple and the symbolism of the rice meal among the Kelabit of Sarawak. In: Carsten, J., Hugh-Jones, S. (Eds.), About the House: Levi-Strauss and Beyond. Cambridge University Press, Cambridge, pp. 84–104.
Jenks, A.E., 1905. The Bontoc Igorot. Bureau of Public Printing, Manila.
Jocano, F.L., 2001. Filipino Prehistory: Rediscovering Precolonial Heritage. Punlad Research House, Quezon City.
Junker, L., 1990. The organization of intra-regional and long-distance trade in pre-hispanic Philippine complex societies. Asian Perspect. 29, 167–209.
Junker, L., 1993. Craft goods specialization and prestige goods exchange in Philippine chiefdoms of the Fifteenth and Sixteenth Centuries. Asian Perspect. 32, 1–35.
Junker, L., 1994. The development of centralized craft production systems in A.D. 500–1600 Philippine. J. Southeast Asian Stud. 25, 1–30.
Junker, L., 1999. Raiding, Trading, and Feasting: The Political Economy of Philippine Chiefdoms. University of Hawai'i Press, Honolulu.
Keesing, F., 1962. The Ethnohistory of Northern Luzon. Stanford University Press, Stanford.
Kvamme, K., Stark, M., Longacre, W., 1996. Alternative procedures for assessing standardization in ceramic assemblages. Am. Antiq. 61, 116–126.
Kwiatkowski, L., 1999. Struggling with Development: The Politics of Hunger and Gender in the Philippines. Ateneo de Manila University Press, Quezon City.
Lambrecht, F., 1929. Ifugaw Villages and Houses. Catholic Anthropological Conference, Washington, DC.
Lambrecht, F., 1955. Ifugao Tales. Folk. Stud. 14, 149–196.
Lambrecht, F., 1967. The Hudhud and Bugan at Gonhadan. Saint Louis Q. 5, 267–713.
Lapeña, Q., Acabado, S.B., 2017. Resistance through rituals: the role of Philippine "native pig" (*Sus scrofa*) in Ifugao feasting and socio-political organization. J. Archaeol. Sci. Rep. 13, 583–594.
Lauer, A., Acabado, S.B., 2015. Infant death and burial practices in late prehistoric Kiyyangan Village, Kiangan, Ifugao. Natl. Mus. J. Cult. Herit. 1 (1), 31–38.
Longacre, W., 1981. Kalinga pottery: an ethnoarchaeological study. In: Hodder, I., Isaac, G., Hammond, N. (Eds.), Pattern of the Past: Studies in Honour of David Clarke. Cambridge University Press, Cambridge, pp. 49–66.
Longacre, W. (Ed.), 1991. Ceramic Ethnoarchaeology. University of Arizona Press, Tucson.
Longacre, W., 1995. Why did they invent pottery anyway? In: Barnett, W., Hoopes, J. (Eds.), The Emergence of Pottery. Technology and Innovation in Ancient Socities. Smithsonian Institution Press, Washington, DC, pp. 277–280.
Longacre, W., 1999. Standardization and specialization: what's the link? In: Skibo, J.M., Feinman, G.M. (Eds.), Pottery and People: A Dynamic Interaction, Foundations of Archaeological Inquiry. The University of Utah Press, Salt Lake City, pp. 44–58.
Longacre, W.A., Hermes, T.R., 2015. Rice farming and pottery production among the Kalinga: new ethnoarchaeological data from the Philippines. J. Anthropol. Archaeol. 38, 35–45.
Longacre, W., Kvamme, K., Kobayashi, M., 1988. Southwestern pottery standardization: an ethnoarchaeological view from the Philippines. The Kiva 53, 101–112.
Longacre, W.A., Skibo, J.M. (Eds.), 1994. Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory. Smithsonian Institution, Washington DC.
Longacre, W.A., Skibo, J.M., 1994b. An introduction to Kalinga ethnoarchaeology. In: Longacre, W.A., Skibo, J.M. (Eds.), Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory. Smithsonian Institution, Washington DC, pp. 1–11.
Madella, M., Lancelloti, C., 2012. Taphonomy and phytoliths: a user manual. Quat. Int. 275, 76–83.
Maher, R.F., 1973. Archaeological investigations in Central Ifugao. Asian Perspect. 16 (1), 39–70.
Maher, R., 1975. The great Ifugao war: a study in archaeology and oral history. Asian Perspect. 18 (1), 63–74.
Maher, R., 1981. Archaeological investigations in the Burnay District of Southeastern Ifugao, Philippines. Asian Perspect. 24 (2), 223–236.
Maher, R.F., 1984. Kiyyangan village of Ifugao province, Philippines. Philippine Q. Cult. Soc. 12, 116–127.
Maher, R.F., 1985. Archaeological investigations in the Burnay District of southeastern Ifugao, Philippines. Asian Perspect. 24, 223–236.
McCay, D., 2003. Cultivating local futures: remittance economies and land-use patterns in Ifugao, Philippines. J. Southeast Asian Stud. 34 (2), 285–306.
Medina, C., 2003. Understanding the Ifugao Rice Terraces. Saint Louis University, Baguio City, Philippines.
Mijares, A., 2003. The complexity of prehispanic Ivatan society. In: Proceedings of the Society of Philippine Archaeologists 3rd Conference, Manila, 2003, pp. 68–76.
Newell, L.E., 1957. Phonology of the Guhang Ifugao Dialect. Bureau of Printing, Manila.
Newell, L.E., 1969. Phonology of Batad Ifugao. Linguistic Society of the Philippines, Quezon City.
Newell, L.E., Poligon, F.B., 1993. Batad Ifugao Dictionary with Ethnographic Notes. Linguistic Society of the Philippines, Manila.
Niziolek, L.C., 2011. Ceramic Production and Craft Specialization in the Prehispanic Philippines, AD 500 to 1600. PhD Dissertation. University of Illinois at Chicago.
Niziolek, L.C., 2013. Earthenware production and distribution in the prehispanic Philippine polity of Tanjay: results from laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). J. Archaeol. Sci. 40 (6), 2824–2839.
Nowaczyk, B., Pazdur, M.F., 1990. Problems concerning the 14C dating of fossil dune soils. Quaestiones Geographicae 11 (12), 135–151.
Peregrine, P.N., Feinman, G.M. (Eds.), 1996. Pre-Columbian World Systems. Prehistory Press, Madison.
Peterson, J.A., 2003. Cebuan chiefdoms? Archaeology of Visayan and colonial landscapes in the 16th and 17th century Philippines. Philippine Q. Cult. Soc. 31 (1/2), 46–97.
Plasencia, J.D., 1589. Customs of the tagalogs. In: Blair, E.H., Robertson, J.A. (Eds.), The Philippine Islands. vol. 7. The Arthur H. Clark Company, Ohio, pp. 173–193.
Potter, J., 2000. Pots, parties, and politics: communal feasting in the American Southwest. Am. Antiq. 65 (3), 471–492.
Raedt, J.D., 1995. Similarities and differences in life styles in the Central Cordillera of Northern Luzon (Philippines): an anti-evolutionary view. In: Cordillera Studies Center Working Paper 03. Cordillera Studies Center, Second printing edition.

University of the Philippines College Baguio, Baguio City, Philippines.
Reyes, J.T., 2010. Reptilya sa kabaong: Isang pag-aaral sa sinaunang paniniwala sa paglilibing sa Banton, Romblon. Master's Thesis. University of the Philippines.
Rice, P.M., 1981. Evolution of specialized pottery production: a trial model. Curr. Anthropol. 22, 2190240.
Rice, P.M., 1989. Ceramic Diversity, Production, and Use. In: Leonard, R., Jones, G. (Eds.), Quantifying diversity in archaeology. Cambridge University Press, New York, pp. 109–117.
Rice, P.M., 1991. Specialization, standardization, and diversity: a retrospective. In: Bishop, R.L., Langes, F.W. (Eds.), The Ceramic Legacy of Anna O. Sheppard. University of Colorado Press, Niwot, pp. 257–279.
Rottländer, R., 1966. Is provincial roman-pottery standardized? Archaeometry 9, 76–91.
Roxas-Lim, A., 1973. Art in Ifugao society. Asian Stud. 11, 47–74.
Sajor, E., 1999. Cutting Trees and the Dynamics of Social Change: the Case of the Ifugao Muyong in the Philippine Uplands. Den Haag, Institute of Social Studies Working Papers, no. 294.
Salazar, Z., 2004. Liktao at apiko: Ang takip ng tapayang libingan ng Libmanan, Camarines Sur. Bagong Kasaysayan, Quezon City.
Scott, W.H., 1974. The Discovery of the Igorots: Spanish Contacts with the Pagans of Northern Luzon, Revised edition. New Day Publishers, Quezon City.
Scott, W.H., 1982. Class structure in the unhispanized Philippines. In: Scott, W.H. (Ed.), Cracks in the Parchment Curtain. New Day Publishers, Quezon City, pp. 127–147.
Scott, W.H., 1994. Barangay: Sixteenth-Century Philippine Culture and Society. Ateneo De Manila University Press, Quezon City.
Skibo, J.M., 1992. Pottery Function: A Use Alteration Perspective. Plenum Press, New York.
Solheim III, W., Schuler, T., 1959. Further notes on Philippine pottery manufacture: Mountain Province and Panay. J. East Asiatic Stud. 8, 1–10.
Stanyukovich, M., 2003. A living shamanistic oral tradition: Ifugao HudHud, the Philippines. Oral Tradition 18 (2), 249–251.
Stark, M., 1991a. Ceramic production and community specialization: a Kalinga ethnoarchaeological study. World Archaeol. 23, 64–78.
Stark, M., 1991b. Ceramic change in ethnoarchaeological perspective: a Kalinga case study. Asian Perspect. 30, 193–216.
Stark, M., 1994. Pottery exchange and the regional system: a Dalupa case study. In: Longacre, W.A., Skibo, J.M. (Eds.), Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory. Smithsonian Institution, Washington, DC, pp. 169–197.
Stark, 1995. Economic intensification and ceramic specialization in the Philippines: a view from Kalinga. Res. Econ. Anthropol. 16, 179–226.
Stark, M.T., Bishop, R.L., Miksa, E., 2000. Ceramic technology and social boundaries: cultural practices in Kalinga clay selection and use. J. Archaeol. Method Theory 7, 295–331.
Stark, M.T., Skibo, J.M., 2007. A history of the Kalinga ethnoarchaeological project. In: Skibo, J.M., Graves, M.W., Stark, M.T. (Eds.), Archaeological Anthropology: Perspectives on Method and Theory. The University of Arizona Press, Tucson, pp. 93–110.
Trostel, B., 1994. Household pots and possessions: an ethnoarchaeological study of material goods and wealth. In: Longacre, W.A., Skibo, J.M. (Eds.), Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory. Smithsonian Institution, Washington, DC, pp. 209–224.
Underhill, A.P., 2003. Investigating variation in organization of ceramic production: an ethnoarchaeological study in Guizhou, China. J. Archaeol. Method Theory 10 (30), 203–275.
UNESCO, 1995. Rice Terraces of the Philippine Cordilleras. http://whc.unesco.org/pg.cfm?cid=31&id_site=722.
Uy, M.T., 2003. Ritual and the construction of power: a preliminary study on the implications of mortuary ritual performance in Ifugao. Master's Thesis. University of the Philippines.
Vanoverbergh, M., 1929. Dress and Adornment in the Mountain Province of Luzon, Philippine Islands. 1. Publications of the Catholic Anthropological Conference, pp. 181–242.
White, J.C., 1995. Incorporating heterarchy into theory on socio-political development: The case from Southeast Asia. In: Ehrenreich, R.M., Crumley, C.L., Levy, J.E. (Eds.), Heterarchy and the Analysis of Complex Societies, Archeological Papers of the American Anthropological Association Number 6. American Anthropological Association, Arlington, pp. 101–123.
Willcox, C.D.W., 1912. The Head Hunters of Northern Luzon: from Ifugao to Kalinga, a Ride Through the Mountains of Northern Luzon: with an Appendix on the Independence of the Philippines. Franklin Hudson Publishing Company, Kansas City, MO.